

TWO NEW SPECIES AND A NEW RECORD SPECIES OF THE GENUS ISOHYPsIBIUS (TARDIGRADA, HYPsIBIIDAE) FROM CHINA

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Abstract Two new species and a new record species of the genus *Isohypsibius* are described and figured from China. The two new species are *I. liae* sp. nov. and *I. rahmi* sp. nov., the new record species is *I. borkini* Tumanov, 2003.

Key words Tardigrada, taxonomy, new species, new record, China.

1 Introduction

In 2005, the authors took two field trips to Qnling Mountains which is located in the central part of Shaanxi Province, China. Among the moss samples collected during these two trips, we found two new species and a new record species of the genus *Isohypsibius*.

Over 120 species of the genus *Isohypsibius* have been described in the world. However, only 8 species of this genus have been reported from China. In this paper, two new species, *Isohypsibius liae* sp. nov., and *Isohypsibius rahmi* sp. nov., and a new record species, *Isohypsibius borkini* Tumanov, are reported and figured.

The specimens are deposited at the College of Life Sciences, Shaanxi Normal University, China.

2 Material and Methods

Specimens were extracted from moss samples and fixed with boiling 85% alcohol. All specimens were mounted in Hoyer's medium. Observation and measurements were made using Phase Contrast Microscopy (PCM) (Leica DM LB2) and an eyepiece micrometer. Photomicrographs were made using PCM associated with digital camera (Leica DFC Twain 6.1.1). Line drawings were made using PCM associated with *camera lucida*.

3 Systematic Accounts

Isohypsibius liae sp. nov. (Figs. 1-7, Table 1)

Holotype (Slide number XYB200506001) was collected from the hinterland of Mt. Qnling (33° 28' N, 108° 29' E; alt. 2 100 m), 1 June 2005.

Description Colourless. Eye spots absent. Body length 232.3 μ m. Dorsum with twelve transverse undulations in different width. Dorsal surface with

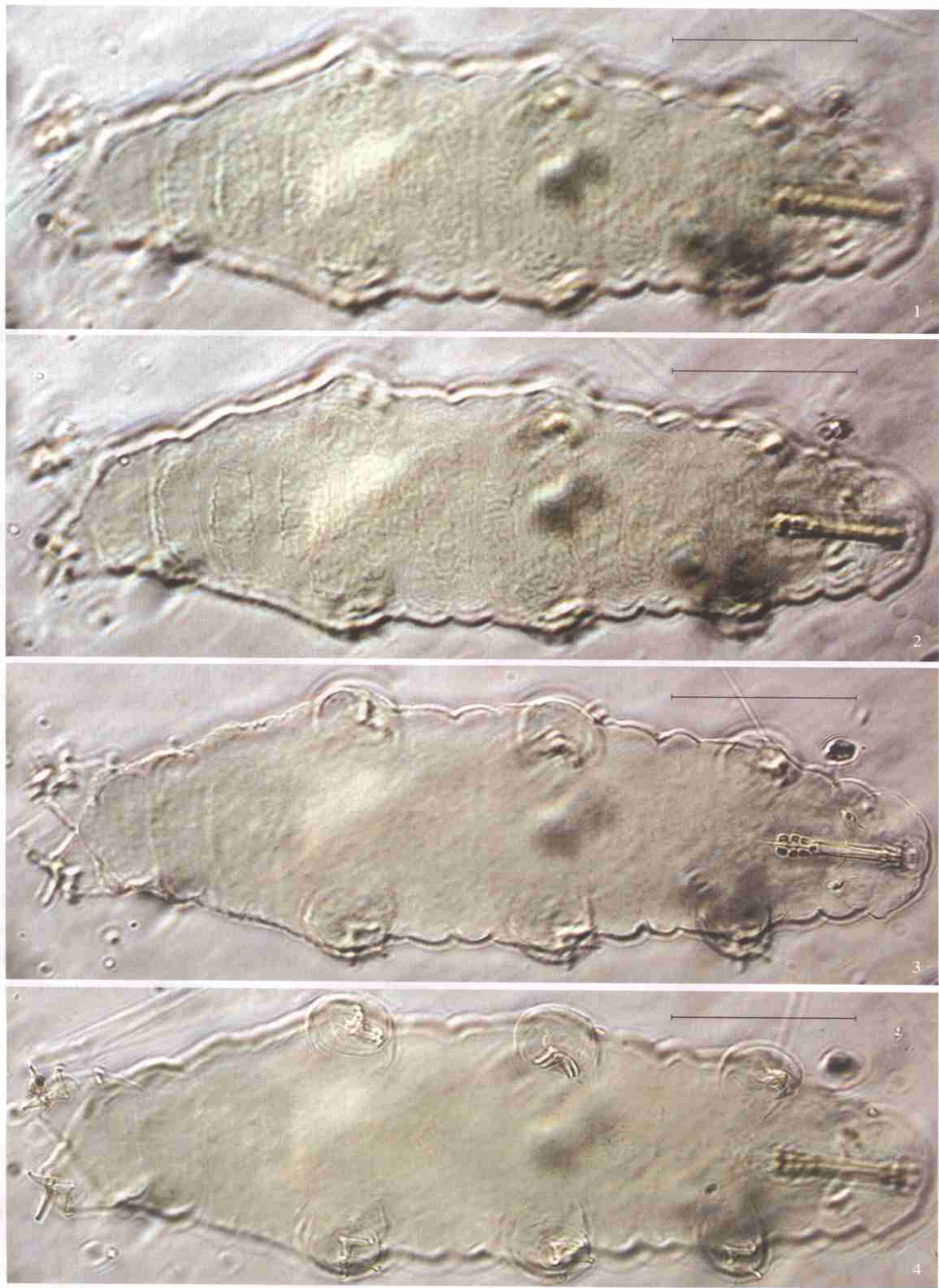
reticular sculpture (Fig. 1); ventral surface also with reticular sculpture but being slightly different from that on dorsal surface (Fig. 2). Mouth without peribuccal lamellae. Buccal tube length 26.1 μ m, external diameter of buccal tube 3.1 μ m (pt = 11.88%) [pt is the percent ratio between the length of a structure and the length of buccal tube (Pilato, 1981)]. Stylet furcae triangular, with posterior-lateral vertices rounded and swollen. Bucco-pharyngeal apparatus of *Isohypsibius* type (according to Pilato, 1982) (Figs. 3, 5). Pharyngeal bulb oval, buccal tube rigid; stylet supports inserted into buccal tube at 66.0% of its length. Pharyngeal bulb with small apophyses and three granule-shaped macroplacoids. Microplacoid absent. Placoid row length 9.4 μ m (pt = 36.02%), the first macroplacoid length 2.1 μ m (pt = 8.05%), the second macroplacoid length 2.1 μ m (pt = 8.05%), the third macroplacoid length 2.9 μ m (pt = 11.11%).

Claws of *Isohypsibius* type (Figs. 4, 6-7), proximal portion of the secondary branch broad, triangular, the common basal portion of claw short, cuticular bars present near base of internal double claws on the first three pair of legs, lunules absent, small accessory points present on primary branches of claws.

Eggs unknown.

Etymology. This species is dedicated to Dr. LI Na who has been helpful to our study.

Differential diagnosis. This new species differs from all known *Isohypsibius* species in its reticular sculpture and three macroplacoids, and in having dorsal transverse undulations or in lacking lunules. It differs from *I. brulloi* Pilato & Pennisi, 1976 in having dorsal transverse undulations, different pattern of reticular sculpture, and in lacking lunules. It differs

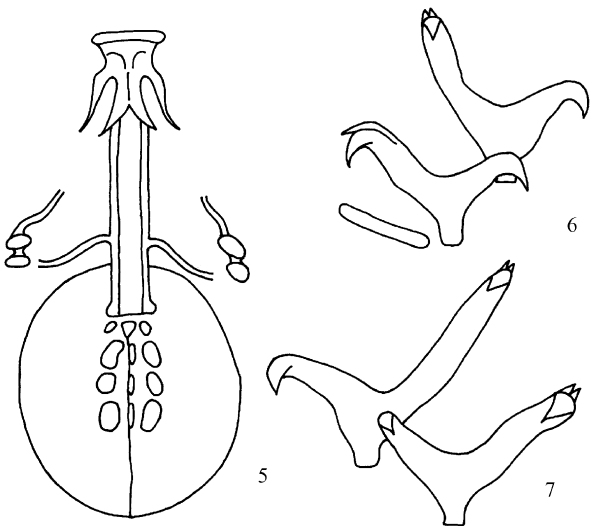


Figs 1-4. *Isohypsius liae* sp. nov. 1. Habitus showing the dorsal transverse undulations and the dorsal sculpture. 2. Habitus showing the ventral sculpture. 3. Habitus showing the bucco-pharyngeal apparatus. 4. Habitus showing the double claws. (1-4. Phase contrast). 1-4. Scale bars= 50 μ m.

Table 1. Dimensions (in μm) of the new species and new record of the genus *Isohypsibius* from Qinling Mountains, Shaanxi Province, China.

Structures		<i>Isohypsibius liae</i> sp. nov.		<i>Isohypsibius borkini</i>	
		μm	<i>pt</i>	μm	<i>pt</i>
Body		232. 3		213. 4	
Buccal tube		26. 1		23. 5	
External diameter of buccal tube		3. 1	11. 88	2. 6	11. 06
Stylet support insertion point			66. 0		72. 22
Placoid row		9. 4	36. 02	10. 4	44. 26
First macroplacoid		2. 1	8. 05	5. 2	22. 13
Second macroplacoid		2. 1	8. 05	3. 1	13. 19
Third macroplacoid		2. 9	11. 11		
External claw I	Primary branch	13. 1	50. 0	10. 4	44. 26
	Secondary branch	7. 8	30. 0	7. 8	33. 19
Internal claw I	Primary branch	10. 4	40. 0	10. 4	44. 26
	Secondary branch	7. 8	30. 0	7. 8	33. 19
External claw II	Primary branch	13. 1	50. 0	10. 4	44. 26
	Secondary branch	7. 8	30. 0	8	33. 19
Internal claw II	Primary branch	10. 4	40. 0	10. 4	44. 26
	Secondary branch	7. 8	30. 0	7. 8	33. 19
External claw III	Primary branch	13. 1	50. 0	13. 1	55. 74
	Secondary branch	7. 8	30. 0	7. 8	33. 19
Internal claw III	Primary branch	10. 4	40. 0	11. 7	49. 79
	Secondary branch	7. 8	30. 0	7. 8	33. 19
Posterior claw IV	Primary branch	15. 7	60. 0	14. 4	61. 28
	Secondary branch	9. 1	35. 0	7. 8	33. 19
Anterior claw IV	Primary branch	10. 4	40. 0	10. 4	44. 26
	Secondary branch	7. 8	30. 0	7. 8	33. 19

from *I. wilsoni* (Horning, Schuster & Grigarick, 1978) (Ramazzotti & Maucci, 1983; Pilato, 1996) in having dorsal transverse undulations, slightly different cuticular sculpture, and in lacking lunules.

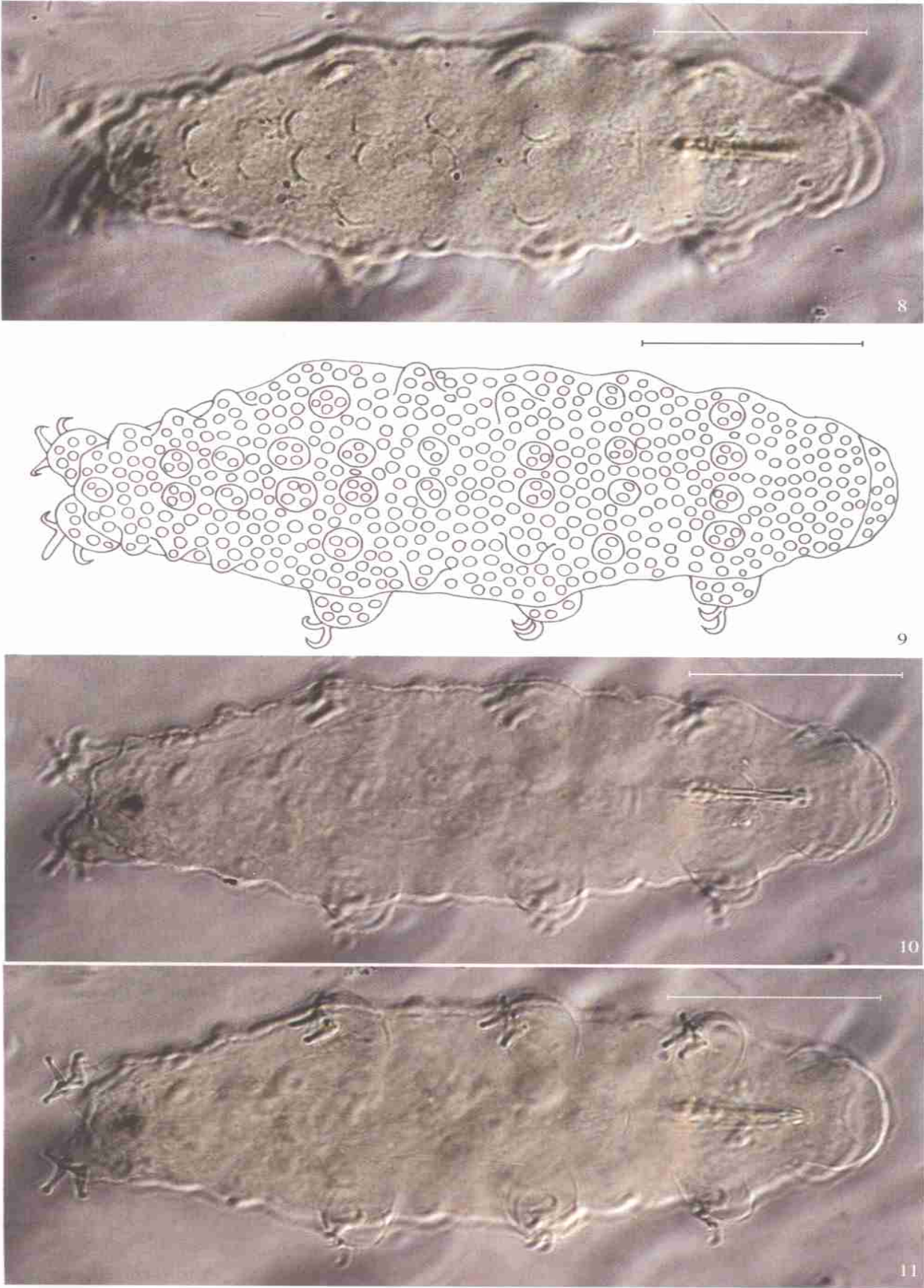


Figs. 5-7. *Isohypsibius liae* sp. nov. 5. Habitus showing the bucco-pharyngeal apparatus. 6. Claws on the 3rd pair of legs. 7. Claws on the 4th pair of legs.

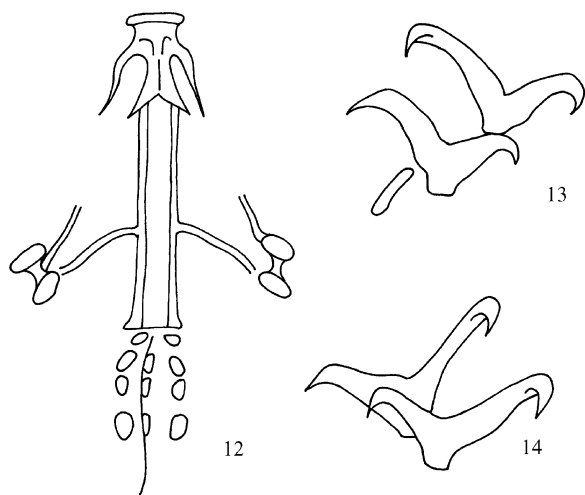
Isohypsibius rahmi sp. nov. (Figs. 8-14, Table 2)

Holotype (Slide number NSQL200504001) was collected from the northern slope of Mt. Qinling (34°72' N, 108°35' E; alt. 1 200 m), in early spring 2005.

Description. Colourless. Eye spots absent. Body length 182.7 μm . Dorsal surface with ten transverse rows of large gibbosities: four gibbosities in rows 1-5, 7 and 8, two in rows 6 and 9, and 1 in row 10. Gibbosities different in size. Dorsal and lateral cuticle as well as legs densely dotted with small hemispherical tubercles, different in size, maximum diameter of tubercle over 2.6 μm (Figs. 8-9). Mouth without peribuccal lamellae. Buccal tube length 21.9 μm , external diameter of buccal tube 3.7 μm ($pt = 16.89\%$). Stylet furca triangular in shape, with posterior lateral vertices rounded and swollen. Bucco-pharyngeal apparatus of *Isohypsibius* type (Fig. 10, 12). Pharyngeal bulb oval, buccal tube rigid; stylet supports inserted into buccal tube at 52.97% of its length. Pharyngeal bulb with small apophyses and three granule-shaped macroplacoids. First macroplacoid and the second one arranged very



Figs 8 11. *Isohypsibius rahmi* sp. nov. 8 9. Habitus showing the gibbosities and small hemispherical tubercles. 10. Habitus showing the buccopharyngeal apparatus. 11. Habitus showing the double claws. (8, 10 11. Phase contrast). 8 11. Scale bars = 50 μ m.



Figs 12-14. *Isohypsibius rahmi* sp. nov. 12 Bucco-pharyngeal apparatus. 13 Claws on the 1st pair of legs. 14 Claws on the 4th pair of legs.

closely. Microplacoid absent. Placoid row length 8.4 μm (pt = 38.36%). Claws of *Isohypsibius* type (Fig. 1, 13-14), cuticular bars present near base of internal double claws on the first three pair of legs, lunules absent. Accessory points invisible on claws.

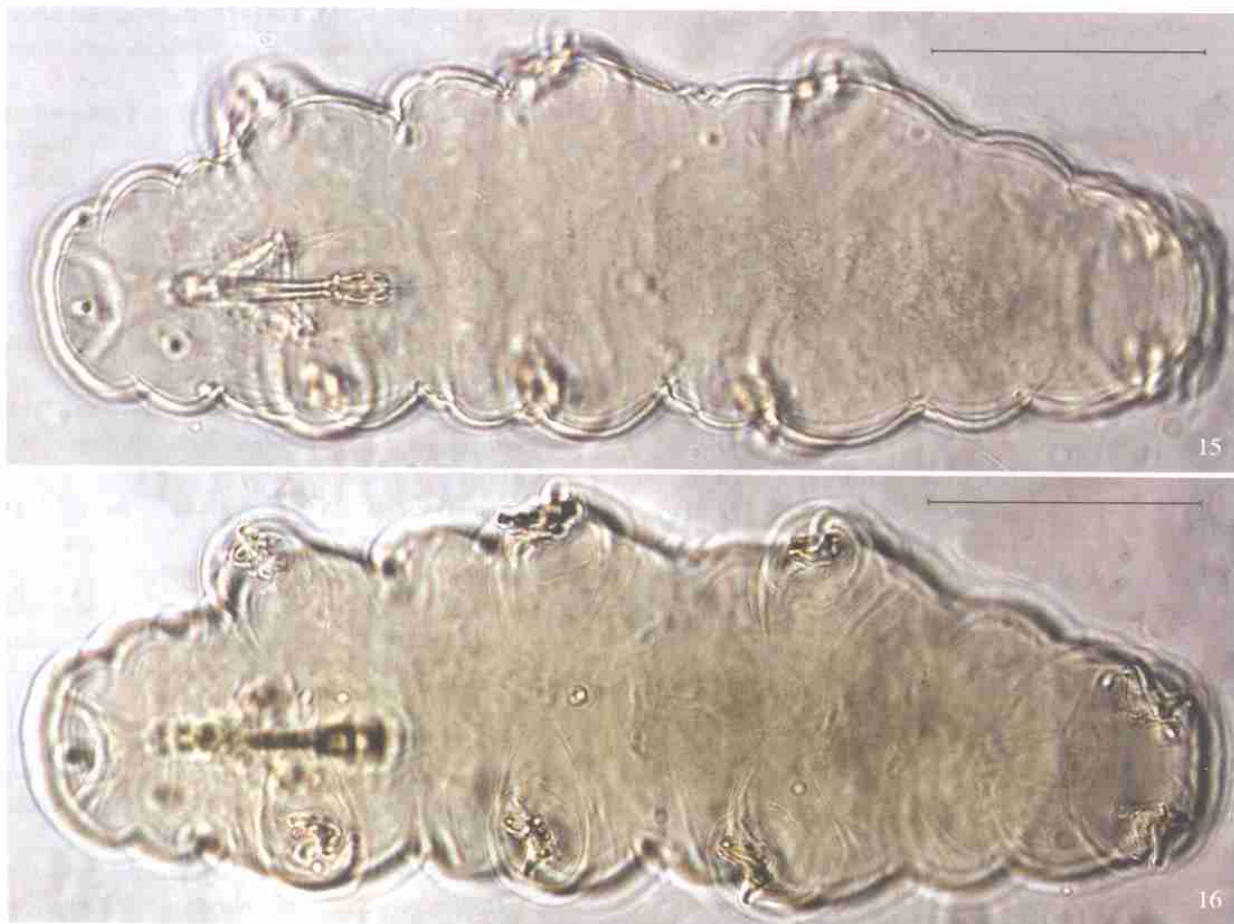
Eggs unknown.

Etymology. This species is named in honor of Prof. G. Rahm who was the first to study the tardigrade fauna of China.

Differential diagnosis. The new species differs from all known *Isohypsibius* species in its large gibbosities and three macroplacoids in number and arrangement of gibbosities in each row. It is somewhat similar to *Isohypsibius qinlingensis* (Li *et al.*, 2005) in having small hemispherical tubercles on cuticle, but differs from the latter in having different arrangement of gibbosities. The former species has configuration of 4-4-4-4-4-2-4-4-2-1 (from row 1 to row 10), while the latter species has configuration of 3-2-3-2-3-2-2-2 (from row 1 to row 8). It differs from *Isohypsibius tuberculatus* (Plate, 1888) (Ramazzotti & Maucci, 1983) in having three macroplacoids and different configuration of gibbosities.

Isohypsibius borkini Tumanov, 2003 (Figs 15-16, Table 1)

Only one specimen (Slide number XYB0506001)



Figs 15-16. *Isohypsibius borkini* Tumanov. 15. Habitus showing the bucco-pharyngeal apparatus. 16. Habitus showing the double claws. (15-16 Phase contrast). 15-16 Scale bars= 50 μm .

was collected from the hinterland of Mt. Qnling (33°28' N, 108°29' E; alt. 2100).

Description Body length 213.4 μm. Body colourless. Eyes absent. Cuticle smooth. Buccal tube length 23.5 μm, external diameter of buccal tube 2.6 μm (pt= 11.06%). Pt index for insertion point of stylet supports 72.22%. Pharyngeal bulb nearly spherical with apophyses and two macroplacoids (Fig. 15). Microplacoid absent. First macroplacoid slightly constricted in the middle. Placoid row length 10.4 μm (pt= 44.26%), the first macroplacoid length 5.2 μm (pt= 22.13%), the second macroplacoid length 3.1 μm (pt= 13.19%).

Claws typical of *Isohypsibius* (Fig. 16). Accessory points present on primary branches of all claws. Lunules present on all claws. Long and thin cuticular bars present near bases of internal claws on the first pair of legs.

Table 2 Dimensions (in μm) of *Isohypsibius rahmi* sp. nov.

Structures		μm	pt
Body		182.7	
Buccal tube		21.9	
External diameter of buccal tube		3.7	16.89
Stylet support insertion point			52.97
Placoid row		8.4	38.36
External claw I	Primary branch	9.2	42.01
	Secondary branch	7.2	32.88
Internal claw I	Primary branch	7.7	35.16
	Secondary branch	5.7	26.03
External claw II	Primary branch	9.9	45.21
	Secondary branch	7.3	33.3
Internal claw II	Primary branch	8.9	40.64
	Secondary branch	6.1	27.85
External claw III	Primary branch	10.7	48.86
	Secondary branch	7.8	35.62
Internal claw III	Primary branch	9.2	42.01
	Secondary branch	6.3	28.77
Posterior claw IV	Primary branch	11.5	52.51
	Secondary branch	8.4	38.36
Anterior claw IV	Primary branch	9.7	44.29
	Secondary branch	6.5	29.68

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中国等高熊虫属二新种和一新纪录种 (缓步动物门, 高生熊虫科)

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摘 要 报道了中国缓步动物门 2 新种和 1 新纪录种 (真缓步纲, 高生熊虫科): 李氏等高熊虫 *Isohypsibius liae* sp. nov., 拉氏等高熊虫 *Isohypsibius rahmi* sp. nov. 和 *Isohypsibius borkini* Tumanov。 *Isohypsibius liae* sp. nov. 背部有 12 列横向排列的隆起, 宽窄不等, 整个身体表面布满网状饰纹; 吸咽球有 3 个近似粒状的大板, 无小板; 前 3 对肢上的内侧爪靠内侧近基部处有角质条, 爪主枝上附棘存在。 *I. liae* sp. nov. 以其背部横向隆起、饰纹或缺少半月板区别于所有已知的 *Isohypsibius* 属的种类。 *Isohypsibius rahmi* sp.

nov. 背部有 10 排大的突起: 按身体前端到后端的顺序, 第 1~ 5 排、第 7 排以及第 8 排每排有 4 个突起, 第 6 排和第 9 排每排有 2 个突起, 第 10 排有 1 个突起; 身体背面、侧面和四肢上密布半球形小颗粒; 吸咽球有 3 个近似粒状的大板, 第 1 大板和第 2 大板几乎相接; 前 3 对肢的内侧爪内侧近基部有角质条, 爪主枝上不见附棘。 *I. rahmi* sp. nov. 以其大的突起排列方式和数目或前 3 对肢的内侧爪内侧近基部有角质条区别于 *Isohypsibius* 属的所有已知种类。

关键词 缓步动物门, 分类, 新种, 新纪录, 中国.
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